than just professional design. As mentioned above, it is not sufficient to argue that research produces better design. Design research needs to explicate its hybrid nature where design and research are integrated. Cross argues for such a position, referring to the not always promising results from attempts of legitimizing design research as a kind of science, from scientific design to design science, not unlike social science's feverous attempts of 'becoming like science' during the 20th century. As we will explain more in the next section, the critical evaluation of these aspirations benefits from Donald Schön's (1983, 1987) postpositivist constructive paradigm.

This discussion fosters recognition of similarities between designerly practices of research, experimentation and intuition and scientific practices. As evident from Science Studies and critical reflection among scientists themselves, the practices of natural science are to a much higher degree than formally recognized about experimental 'designerly' intuition (Galison 1987). The emergence of design research is therefore embedded in the broader reflective transformations of science, education and the knowledge society that science studies, and designers like Buchanan (2001) and Cross (2006) have argued for. Designerly ways of knowing are of a broader relevance than just for traditional design professions. In order to meet the challenges of the present world, designerly ways of knowing are becoming part of what contemporary societies need (Cross 2006: 11).

However, design research is more than programmatic. Over recent years approaches that constructively appreciate the systemic interdependencies between designed objects, use and context, and between designers and the people they are designing for have emerged that provide prototypes. Participatory or collaborative design (see e.g. Greenbaum and Kyng 1991, Schuler and Namioka 1993, Voss et al. 2008) have a long tradition and practices in the area of information technology-based socio-technical innovation, and there are other approaches, such as user-led design in the commercial sector (Von Hippel 2005), and open source design in technology (Ghosh 2006) but also in other areas such as urban design (Fuller and Haque 2008) expanding the scope and ambition of collaborative design approaches. They aim for different forms of collaboration, explicit, open, and collective experimentation, creating not just products and technologies, but also support for creative appropriation, new processes and services, and they productively blur the boundaries between designers, engineers, users, the technical sciences, the social sciences, and the humanities.

FROM MULTI- VIA INTER- TO POST-DISCIPLINARITY

Interdisciplinary design research is emergent, always in the making, alive, a constantly evolving collective effort. In this book, we do not aspire to provide a comprehensive overview or map of the field. Instead, we want to clarify through case studies and reflective accounts what makes design research matter. A variety of research traditions are involved and they differ in their understandings of the relationship between research

and design, as explained with the fourfold typology introduced above with our main interest in the synthetic third: research through design and design through research.

Design research includes analytical and descriptive as well as formative, normative, and prescriptive studies. To better understand design processes – in general and in specific fields – we study the practices of designers who want to change something or make something new. We identify the kinds of processes that are decisive to obtain attractive effects or outcomes. Meanwhile we also discuss the forms of normativity developed in some fields, such as in information systems and participatory design. Scientific disciplines clearly have different traditions in regard to analytical versus prescriptive studies. Our ambition is to point to a complex field of synergies involving, across analysis and prescription, but *not* to *one* meta-narrative. Synergies (chapter 14) emerge from a diversity of sources and relations.

It is no coincidence that in spite of forty years of design research a unified cross-disciplinary (or interdisciplinary) body of theory about design has not been developed (Cross 2007). Many have called upon design researchers to develop such a body of theory. But obstacles to the development of a coherent interdisciplinary theoretical, epistemological and terminological basis for research and theory making, include a lack of agreement about definitions of core concepts and terminology. Furthermore there is poor integration of theories specific to designing and designs. It is thus a question whether it is at all possible to specify and differentiate theories of designing and designs from theories of other fields. Terence Love (2002) suggests that a coherent body of interdisciplinary design theory should address and identify cross-disciplinary relevant definitions of core concepts of design and design-processes.

We doubt that a unified theory of design is possible, feasible, or necessary. However we agree with Love (2002) that theories of design should be developed and related to theoretical debates elsewhere. Knowledge about design research, its possibilities, advantages and difficulties is highly desirable and relevant. To some degree, it is possible to identify general and common themes that characterize different strands of research for, into, and through design. However, we do not want to territorialize a new exclusive field of design research with borders to science, humanities and social sciences. Above we marked some similarities between the formation of social science and of design research, and we could point to other convergences with developments in engineering, science studies and cultural studies. Inclined to such an agenda, this book provides an initial picture of core themes of design research around participation (chapter 2, 7, 11, 12), design exemplars (chapter 4, 5), epistemic and material practices (chapter 3, 6, 10), translations, transitions and actor networks (chapter 3, 8, 9, 13).

We approach design research from a number of different disciplinary and interdisciplinary perspectives – computer science, informatics, sociology, geography, organisational studies, performance design, planning, urban studies and cultural studies, and we discuss many different application areas for design. These include information technologies, engineering, healthcare, safety management, policy, service design, economics, sustainable products, public exhibitions, performance and tourist